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Inter-firm collaboration in the Fuzzy Front-End of the innovation process
- Exploring New Forms of Collaboration

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Introduction

Innovation and innovation processes have traditionally been considered from the manufacturing companies' perspective. The innovation process is typically divided into a series of succeeding stages where the Fuzzy Front-End is the first stage to encounter. Several research projects have formulated recommendations for the manufacturer to improve the innovation process and enhance the chances of success. However, the vast majority of these projects belong to an intra-firm paradigm where the manufacturer is considered to be the only part involved in the process, controlling and influencing the environment (Cooper 2005; Cooper & Kleinschmidt 1987; Tidd, Bessant, & Pavitt 2005).

As a result of enhanced competition and pressure on manufacturing prices increasing focus is put on inter-firm collaboration and innovation competences. Companies can engage in such inter-firm collaborations in regard to many different activities e.g. logistics, marketing, sales. The focus of this paper is on inter-firm collaboration where innovation is the main part of the collaborative effort.

Innovation in this respect refers to the research and development (R&D) activity devoted to increasing scientific or technical knowledge and the application of that knowledge to the creation of new and improved products and processes (Hagedoorn 2002).

Formal innovation partnerships have been widely researched. (Bart Nooteboom 2003; Faems, Van Looy, & Debackere 2005; Hagedoorn 2002; Powell, Koput, & Smith-Doerr 1996). The research has provided useful insights in the dynamics and tendencies in formal R&D partnering relations. This paper, however, focuses on collaboration between independent companies **prior** to such formal agreements as joint ventures or other contractual agreements.

This first phase of the innovation process is often referred to as the Fuzzy Front-End (FFE) and is traditionally seen as an intra-firm process (Jongbae & David 2002; Kim & Wilemon 2002; Qingyu & William 2001; Reid & de Brentani 2004). As the innovation process becomes an inter-firm collaboration the management of the FFE also changes and calls for new ways of collaboration. This article examines the characteristics of the FFE phase and explores this phase in an inter-firm perspective. Through an in-depth case-study of a single firm and its innovation partners parameters for improved collaboration in the FFE are identified.

The objective of this paper is to elaborate on the differentiating characteristics between intra-firm and inter-firm FFE projects. Focus is on management methods of the collaboration and the CEO-commitment to the project.

Firstly the methodological approach is described. Secondly a discussion of the collaboration dichotomy is carried out. Thirdly, the FFE phase is characterized through a literature review followed by a brief case description. Finally the case is analyzed in relation to the factors *management methods*, *formalization* and *CEO-commitment*. This is done in order to reveal differences in going through the FFE in an intra-firm and an inter-firm setting.

Methodology

The paper will be based on a case study of a Danish inter-firm network within the energy sector. The focal firm KMD, which is a major Danish IT provider, wished to enhance its penetration in the B2C market by providing internet services on energy consumption. In order to accomplish this vision, the focal firm initiated a network of firms potentially in a situation to contribute. During a period of one year four network meetings were carried out. A maximum of 12 firms were participating but on some occasions only a limited number of firms took part.

In order to get an in-depth understanding of the dynamics involved in an inter-firm FFE project, the case study method has been applied, in accordance with the guidelines set forth in, (Eisenhardt 1989; Eisenhardt & Graebner 2007; Flyvbjerg 2006; Yin 1994)

The authors have been actively involved in the network as participants, sparring partners and observers at network meetings in the network formation and development. To increase the validity of the research, different sources of data have been triangulated: Documents, observation and interviews. The observations have also been triangulated, since different researchers with differing theoretical standpoints have been present at the network meetings. Subsequent to all meetings, the observations and reflections were discussed. At the end of the FFE phase, the involved networking partners have participated in in-depth interviews. The questions in these interviews have been related to theoretical constructs, and not been aimed at verifying or falsifying specific relations between parameters. All interviews have been recorded and transcribed, and interpretations of the interviews have been discussed by at least three researchers. The aim of these triangulating actions has been to ensure that all relevant alternative interpretations have been included.

Overall, the case study method has been used to describe the relevant parameters for inter-firm collaboration in FFE projects, and furthermore it has been explained why these

parameters are relevant. See appendix 1 for further elaboration on the methodological approach to the case study.

Collaboration

Powell (1990) presents a taxonomy of three overall forms of collaboration: Hierarchy, networks and markets.

Table 1 - *Three forms of Collaboration (Powell 1990)*

	Hierarchy/ Intra-firm collaboration	Network/ Inter-firm collaboration	Market
Normative basis	Employment relationship	Complementary strengths	Contract, property rights
Means of communication	Routines	Relational	Prices
Tone or climate	Formal/bureaucratic	Open-ended, mutual benefits	Precision and/or suspicion
Actor preferences or choices	Dependent	Interdependent	Independent
Methods of conflict resolution	Fiat/supervision	Reciprocity and reputation	Haggling

Table 1 illuminates the essential differences between the three kinds of collaboration. Hierarchical and market collaboration are located at opposite ends of the continuum while networks are a hybrid between the two extremes. The distinction between hierarchy and network is equivalent with the difference between intra-firm and inter-firm relations. Though some hierarchy might exist between two firms in a network (in terms of size, intellectual properties, economic and staff resources etc.), the normative basis, communication, tone etc. will differ from the intra-firm collaboration. Thereby the managerial implications of handling the FFE also differ from an intra- to an inter-firm perspective.

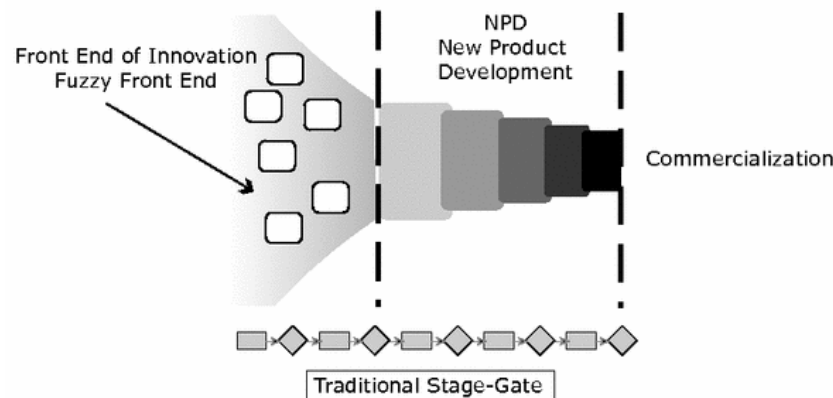
For instance the inter-firm network is not funded on the same degree of routines and formal tone as the hierarchy – and direct means of power such as fiat and supervision will not be feasible in a network set-up. The reciprocity, interdependence and complementary relationship between the firms involved in the network make the sources of influence and power much more subtle.

What is The Fuzzy Front-End?

The Fuzzy Front-End (FFE) is the first phase of the innovation process and initiates the process by producing ideas for incremental or radical product or service concepts. The term “Fuzzy” refers to the intangible nature of this particular stage of the innovation process. It is considered fuzzy for a number of reasons, for example uncertainties and unknown issues concerning the needs of the customers, uncertainty about what competitors are doing, and uncertainty about which product and process technologies should be used. Also uncertainty concerning strategy alignment, required resources, capabilities and company limits prevent an opportunity from going on to the more structured New Product Development (NPD) phase (Kim & Wilemon 2002).

Thus many of the practices that are used in the NPD phase do not apply to the FFE. They fall short because the nature of work, activities, funding level, revenue expectations, and measures of progress are fundamentally different (Koen et al, 2002).

Figure 1 – What is The Fuzzy Front End?



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The FFE is of interest because it has a great influence on the success of the innovation project (Qingyu & William 2001). As ideas are generated in the front end this is both the most troublesome weak part of the innovation process and at the same time the phase which represents the biggest potential (Reid & de Brentani 2004). The outcome of the FFE is a well defined concept, clear development requirements, and a business plan aligned with the corporate strategy (Kim & Wilemon 2002).

According to Moneart et al. (1995) a firm formulates a product concept and determines whether or not it should invest resources to develop the idea through the FFE. Based on

the process developed by Cooper (1988), Murphy and Kumar (1997) define the predevelopment stages as consisting of idea generation, product definition, and project evaluation.

In this article the FFE is defined as (Kim & Wilemon 2002):

“..as the period between an opportunity is first considered and when an idea is judged ready for development.” (p. 269)

The FFE phase thereby includes the development of the concept but not the concrete product.

As shown by (Murphy & Kumar 1997) the management of the FFE in intra-firm settings is essential and unsuccessful management of this phase can have considerable consequences. If the project enters the development phase without sufficient preparation there is a high risk of project delays and budget escalations (Kim & Wilemon 2002). Further (Clark & Fujimoto 1991) point out that engineering changes occurring late in the development are costly and time consuming.

Table 2 Characteristics of the FFE phase in an intra-firm perspective. Adapted from (Kim & Wilemon 2002)

Factors	General characteristics of the FFE phase – Intra-firm perspective
State of an idea	Probable, fuzzy, easy to change
Features of information for decision-making	Qualitative, informal and approximate
Outcome (/action)	A blueprint (/diminishing ambiguity to decide whether to make it happen)
With and depth of the focus	Broad but thin
Ease of rejecting an idea	Easy
Degree of formalization	Low
Personnel involvement	Individual or small project team
Budget	Small/none
Management methods	Unstructured, experimental, creativity needed
(Visible) damage if abandoned	Usually small
Commitment of the CEO	None or small

In the following sections the factors Management Method, Formalization and CEO Commitment from table 2 will be considered in an inter-firm collaboration perspective. These have been chosen for further elaboration as the analysis revealed considerable differences in this respect between the intra-firm and inter-firm setting.

Case description

The case started with KMD having introductory meetings with potential network partners at their respective company locality. The purpose of these meetings was clear to both parties involved. KMD would present the idea of a digital platform for B2C services within the energy area and wanted to find out whether the partner was interested in participating in the development of this project. At the end of each meeting KMD invited interested partners to participate in an up-coming meeting where all interested parties would be invited. Two month after the last introductory meeting was held all interested network partners participated in a meeting held at KMD's meeting facilities. The purpose

of this meeting was communicated as a chance to meet the other participants and to provide input to the concept development of the platform.

At the first meeting which the director of KMD was chairing, KMD presented their perspective on the digital platform. Their presentation included functions which should be incorporated on the platform as well as a flow chart illustrating how information flows in the system could be structured.

During the six hour long meeting at KMD, there was a lot of discussing and brainstorming concerning a wide variety of issues. The main topics were price, market potential and functionality of the product. The discussions were unstructured and the topics discussed were discussed due to participants putting them forward. At the end of the meeting the general assumption was that nothing new had appeared in regard to the functionalities of the platform and that still most questions were unanswered in regard to the market and the price.

In response KMD suggested a second meeting to be held one month after where new participants with different backgrounds should be invited in addition to the present participants. The purpose of this second meeting would be creative thinking and idea generation concerning the platform.

The first meeting ended with KMD handing out questionnaires to the participants with the purpose of making a status of which participants would still like to be involved in the development of the platform. The participating network partners expressed their wish to get minutes from the meeting and KMD agreed that minutes would be put on the website.

The second meeting was postponed four month and the minutes were not put on the website. Even though many of the participants had answered positively in the questionnaire they did not show up at the second meeting. A considerable group of participants did not think that there was a concrete outcome of the meeting and therefore they chose not to participate in the following meeting.

Case analysis: Management Methods and Formalization

The term *Management Methods* is closely linked to the term *Formalization*. Accordingly both will be considered in this part of the analysis.

In the traditional intra-firm way of going through the FFE process the loose idea or opportunity spotted is still an internal process within the company. In such an intra-firm

perspective a relatively unstructured management method is traditionally used. The work done in relation to the idea is often characterized by a very low degree of formalization. Meetings are held without agendas and are done on an accidental basis or due to a coincidence of events. The management method is unstructured and encourages experimentation. This is a management method which supports the creative process and desire to explore ideas and opportunities. Ideas that pop-up later become formalized projects in the NPD process or disappear without notice. Some survive in other projects and some are gone forever. However, in an inter-firm perspective the lack of structure is an immanent issue to be addressed by the company.

As a focal firm invites network partners to participate in this stage of the innovation process they should consider that their partners would expect some kind of outcome. This is related to the issue of resources. The invited partners might need to travel in order to participate and they most certainly will need to spend time participating. Thus, it is not for free to participate in the meetings. One thing is to meet informally at the grounds of your own firm, but it is a quite different thing to spend considerable resources preparing, travelling and participating in meetings with the sole purpose of providing potential innovation partners with valuable input.

According to our case and an analytical approach, it seems reasonable to claim that there ought to be a fair structure for the process in order to ensure successive outcome to the participants through the FFE. An informal meeting in an intra-firm perspective is quite different from an “informal” meeting in an inter-firm perspective. If participants do not perceive tangible outcome they are likely to quit the network. In another perspective too much structure in the concept that is to be developed will suppress creative inputs from the innovation partners.

Two levels of structure should be considered;

1. Structure of content
 - a. Open vs. Closed concept
2. Structure of work process
 - a. Structured vs. Unstructured

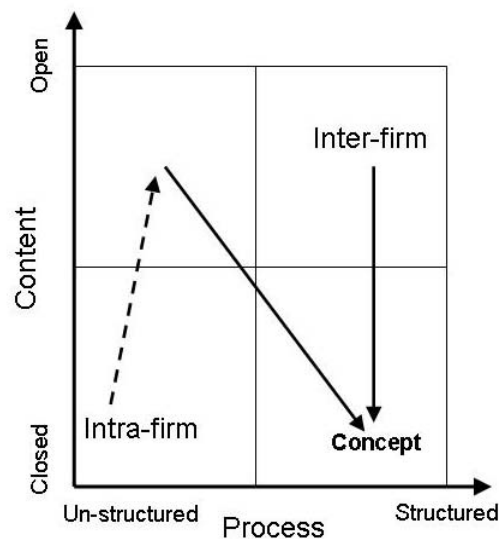
The structure of content is related to the thinking processes concerning the concept that is to be developed during the FFE. If the concept is presented as a closed concept with specified technologies, functionalities and information flows, the way participants will discuss the project will be within the structure of that concept. If the concept is presented as an open-concept with multiple alternatives regarding technology, functionality and information flows the participants will be more likely to come up with creative input

(Basadur et al. 2000). In our case KMD presented the digital platform as a closed concept leading to a lack of input from the participating innovation concerning the concept.

The structure of process refers to the work process in relation to the development. Is there a clear purpose of meetings, agendas, chairman of meeting; is the outcome of each meeting made explicit? The case has shown that in the case of the first meeting in the network, the purpose of the meeting was clear but the outcome of the meeting was very unclear. Even though the participants explicitly asked for a tangible outcome in the form of minutes, such were never provided for them. Instead the outcome was presented to them as an upcoming meeting which in the end was postponed four months.

Figure 2 illustrates the difference going through the FFE phase in an inter-firm setting vs. an intra firm setting towards the goal of the FFE phase – a well defined concept, clear development requirements, and a business plan aligned with the corporate strategy

Figure 2 – Two Levels of Structure in FFE Concept Development



Based on table 2 and case analysis

In the intra-firm setting the process can be unstructured from the beginning and gradually become more structured as the personnel involvement becomes clearer and the concept takes form (Jongbae & David 2002; Kim & Wilemon 2002). It can also start as a

somewhat closed concept developed by a small group or an individual and then be challenged by colleagues and as a result become open.

In the inter-firm setting it appears central that the process takes off with an open concept where the collaboration is based on a structured process. The interaction between participants is limited and the structure should support creative inputs and new perspectives on the concept.

The challenge in regard to structure, of going through the FFE in an inter-firm setting is thus to provide successive tangible output in an intangible process. Balancing the two levels of structure ensuring that the concept is presented as open so that creative input from participants is elucidated and having a clear structured work process that explicitly reveals output and progress in the process. As there can be no use of direct fiat in such inter-firm settings the focal firm needs to structure the development work process and the creative thinking process in a way that provides tangible output and allows the recombination of knowledge and thereby new ideas (Brown & Duguid 2000). The risk is that partners will loose their commitment if they do not see a continuous development and progress in the process.

Case analysis: CEO Commitment

The top managers of a firm must consider the role that he or she plays in the FFE phase. The attention and decisions on the level of commitment are clearly linked to the management methods, formalization and structure considerations discussed above. If the degree of formalization of the FFE phase is high, the CEO is more likely to be actively involved than if it is a bottom-up, team-based, unstructured phase.

As stated in table 1, the level of top management involvement in the FFE phase in an intra-firm perspective is generally limited or even not existing. The unstructured experiments by the individual employees do not imply involvement by senior managers. Mid-level managers might be involved in terms of letting the employee(s) have some hours per week to carry out their experiments but otherwise the intra-firm FFE phase does not require a high degree of management involvement.

The issue of CEO involvement in the inter-firm FFE phase is quite different. As a point of departure the top managers are part of the idea selling process: They have to convince the potentially participating network partners to take part in the project. The fact that the CEO is actively involved can contribute to stress that the focal firm is committed to the outcome of the specific project and the inter-firm collaboration as such. One should keep

in mind that the collaboration is still not formalized and can be characterized as a network where the CEO has no direct power.

However, the case analysis has revealed that the active involvement and commitment of the top managers is a two-edged sword. If the CEO in an inter-firm FFE phase is too committed, it might make the other participating organisations nervous about a potential bias in the distribution of the benefits generated from the collaborative effort.

The director of KMD has been addressing this balance in numerous discussions with his colleagues and the researchers that have been involved. At the first meeting he chose the rather active role because he expected this to enhance the involvement of the participating organisations. At the second meeting he outsourced the chairing role to an external process consultancy in order not to be too dominant and by this hampering the innovative processes. The case analysis illustrates the delicate balance between high level of commitment from the top manager to convince the potential partners to get involved on one side and the fear of scaring the partners away from the project on the other. Thus, the involvement of the top manager is an exercise of understanding the preferences of the participating organisations in terms of showing commitment on one side and not being too eager on the other.

Conclusion

This article has discussed the differences of going through the FFE phase of the innovation process in an intra- versus an inter-firm setting. In respect to collaboration form the latter is characterised as a *network* where no direct power can be employed as appose to an intra-firm setting which is characterised as *hierarchy*. Through an in-depth case study analysis we have focused on two main differences – namely the *management methods* (formalization) and the *CEO-commitment*. In regard to *management methods* the analysis showed that in an inter-firm setting two levels of structure should be considered.

1. The structure of content: Whether the concept is formulated as an open or a closed concept.
2. The structure of the work process: Whether there is clear purpose of meetings and the outcome of each meeting is made explicit.

CEO and top management commitment in an inter-firm setting showed to be a balance between using this commitment to stress the focal companies' commitment to the project

in order to get the network partners to participate and not becoming too committed as this could result in participants leaving the project.

Further research

For further research could be aimed at better understanding of why organisations join networks of collaborative innovation. The present research has shown that having insight in the expectations and motivations of participating organisations in a network collaboration setting is of great value to the focal company. Developing a methodological approach for acquiring such knowledge should be of high priority to both academics doing research within the field of network dynamics and practitioners balancing the structure of Content, Work Process and CEO-Commitment on a daily basis.

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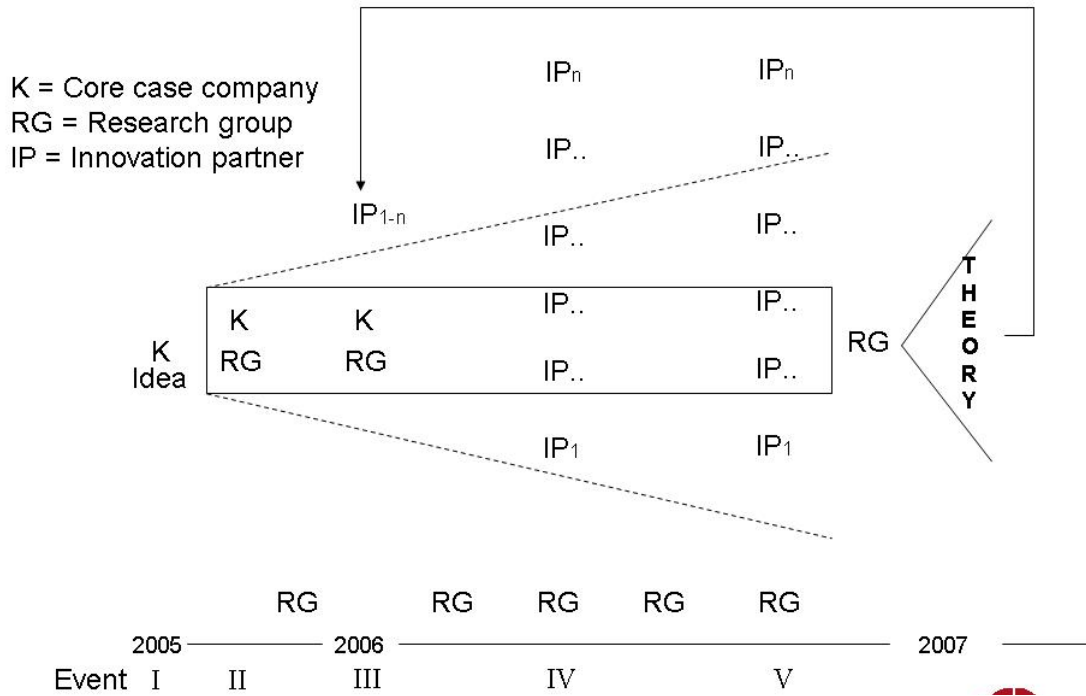
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Appendix 1

Process of the case-study



The purpose of the case-study was to get a rich and deep foundation of data de-scribing the dynamics and processes in the development of K's innovation project. A prerequisite for fulfilling this objective was getting as close to the data as possible. In this case study it meant to attend as many meetings as possible, both network meetings and internally at K.

The figure describes the process of the case-study of K. The initial idea was K's, prior to any researcher involvement. The figure illustrates the research process applied when gathering data, validating data and building a new theory on network-based innovation processes.

The model illustrates who participated in which events as well as the ongoing development of the mental framework (the dotted lines), related to the meetings and seminars (events). The mental framework should be understood as the perspective of the Research Group ("RG") – it is thus the foundation for all the work that is done, but a foundation that is ever-changing.